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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/743,268	12/23/2003	Boris Laikhtman	SHVARTSMAN1	4450

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BROWDY AND NEIMARK, P.L.L.C.
624 NINTH STREET, NW
SUITE 300
WASHINGTON, DC 20001-5303

EXAMINER	
LOUIE, WAI SING	
ART UNIT	**PAPER NUMBER**
2814	

DATE MAILED: 07/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H:A

Office Action Summary	Application No.	Applicant(s)	
	10/743,268	LAIKHTMAN ET AL.	
	Examiner	Art Unit	
	Wai-Sing Louie	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 May 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-59* is/are pending in the application.

4a) Of the above claim(s) *35-59* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-n are rejected under 35 U.S.C. 102(e) as being anticipated by Ohno et al. (US 6,476,441).

With regard to claims 1 and 34, Ohno et al. disclose a light-emitting element (col. 4, line 28 to col. 7, line 18 and fig. 1) operable in THz range (col. 5, line 44), the device comprising a heterostructure including a first and second semiconductor layers 5 and 6 (col. 4, lines 35-38 and fig. 1) being made of materials providing a quantum mechanical coupling between an electron quantum well in the first layer 5 and a hole quantum well in the second layer 6 col. 4, line 38-41), providing an overlap between valance band of the second layer 6 and the conduction band of the first layer 5 (col. 5, lines 18-26), and providing an overlap between the valance band of the second layer 6 and the conduction band of the first layer 5 (col. 4, lines 45-48), a layout of the layers of the heterostructure being selected so as to provide a predetermined dispersion of energy subbands in the conduction band of the first layer 5 and in the valance bans of the second layer 6 to define a desired effective overlap between the energy subbands of the conduction and valance bands (fig. 1). "The application of an external bias field across the first and second layers causes

the THz spectral range radiation originating from radiative transitions of non-equilibrium carriers between the neighboring energy subbands of the EQW", are written in functional language, which does not carry any patentable weight. Please see the explanation below:

A "product by process" claim is direct to the product *per se*, no matter how actually made. See *In re Thorpe et al.*, 227 USPQ 964 (CAFC, 1985) and the related case law cited therein which makes it clear that it is the final product *per se* which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. As stated in Thorpe,

> even though product by process claims are limited by and defined by the process, determination of patentability is based on the product itself. *In re Brown*, 459 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935).

Note that applicant has burden of proof in such cases, as the above case law makes clear.

With regard to claim 2, Ohno et al. disclose the first layer 5 is InAs and the second layer is GaSb (col. 4, lines 35-36).

With regard to claim 4, Ohno et al. disclose the first and second layers 5 and 6 are directly coupled to each other with no additional layer between them (fig. 1).

With regard to claims 5-6, Ohno et al. disclose the heterostructure comprises an AlSb based barrier layer 36 between the first and second layers 35 and 37 (col. 6, lines 31-33 and lines 52-59).

With regard to claims 8-10, Ohno et al. disclose the first and second AlSb-based cladding layers 39a and 39 b enclosing the first and second layers 35 and 37 with the barrier layer 36 in between (fig. 9).

With regard to claims 16-19, Ohno et al. disclose the parameters controlling the predetermined dispersion of the energy subbands includes the thickness of the well layer (col. 4, lines 41-44) or changing the composition of material of the barrier layer (col. 5, lines 13-17).

With regard to claim 11-15, 20-25, and 27-33, the claimed limitations are written in functional language, which does not carry any patentable weight. Please see the explanation in claim 1.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohno et al. (US 6,476,441).

With regard to claims 3 and 7, Ohno et al. disclose the well width can be changed by changing the thickness of the first layer 5 (col. 4, lines 41-44), but do not disclose the thickness of the layers. However, the thickness is considered to involve routine optimization, which has

been held to be within the level of ordinary skill in the art. As noted in In re Aller, the selection of reaction parameters such as the thickness, would have been obvious:

> "Normally, it is to be expected that a change in temperature, or in thickness, or in time, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art...such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."
>
> *In re Aller 105 USPQ233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).*

Therefore, one of ordinary skill in the requisite art at the time the invention was made would have used any thickness suitable to the method of the process in order to optimize the design.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohno et al. (US 6,476,441) in view of Bour et al. (US 6,618,413).

With regard to claim 26, Ohno et al. do not disclose predetermined potential profiles of the EQW and HQW include substantially semi-parabolic and step-like profiles. However, Bour et al. disclose a step-like and substantially semi-parabolic profile of the potential barrier at the interface between two composition different semiconductor layers (Bour col. 5, lines 29-50 and fig. 6). Bour et al. teach dividing the large potential barrier into smaller steps would lower the

threshold voltage compared to the single interface (Bour col. 5, lines 56-60). Therefore, it would have been obvious to one of ordinary skill in the art to modify Ohno's device with the teaching of Bour et al. to provide a step-like and substantially semi-parabolic profile in order to lower the threshold voltage of the device.

With regard to claim 35 to 59, although, applicant has amended the claims to change the dependency to claim 1, however, they will not be examined. These claims are method of fabricating the device, which is not in the scope of the prosecution, since the applicant has elected the device prosecute.

Response to Arguments to the Restriction

Applicant elects Group I, claims 1-34 drawn to a semiconductor device with traverse. The applicant argues that there would be no serious burden in examining both groups. However, Group I is drawn to a semiconductor device and Group II is drawn to a method of forming the device. The Inventions Group I and Group II are related as process of making and product made and the inventions Group I and Group II belong to different classes, which require separate searches and considerations. The separate searches and considerations for each group would provide a burden on the examiner. As such, the restriction is proper and the restriction is final. It is suggested that non-elected claims be canceled in the response to this Office Action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wai-Sing Louie whose telephone number is (571) 272-1709. The examiner can normally be reached on 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Wsl
July 14, 2005.